

15 MARCH 1988

SUPERSEDING

MIL-A-85670(AS)

12 February 1987

MILITARY SPECIFICATION

Antenna, Broadband

AS-3191/A, AS-3792/A, and AS-3793/A

This specification is approved for use within the Naval Air Systems Command, Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the design, performance, and acceptance requirements for AS-3191/A, AS-3792/A, and AS-3793/A Broadband antennas hereinafter referred to as the antenna. The separately nomenclatured antennas differ only in surface finish and color. The antenna is a universal blade type to be used in aircraft equipped with the AN/ARC-182(V) Radio Set. The antenna is an aircraft fuselage mounted blade enclosed element. The antenna is a broadband, fix tuned, exhibits omnidirectional radiation pattern, and is vertically polarized for radiating and receiving radio waves in the 30-88 MHz, 108-174 MHz, and 225-400 MHz communication bands.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specification and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (SESD) Code 53, Lakehurst, NJ 08733-5100 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

MILITARY

MIL-P-116	Preservation, Method of
DOD-D-1000	Drawings, Engineering and Associated Lists
MIL-E-5400	Electronic Equipment, Airborne, General Specification for
MIL-R-7705	Radomes, General Specification for
MIL-S-8516	Sealing Compound, Polysulfide Rubber, Electrical Connectors and Electrical Systems, Chemically cured
MIL-E-17555	Electronic and Electrical Equipment, Accessories, and Repair Parts, Packaging and Packing of
MIL-T-18303	Test Procedures; Preproduction, Acceptance and Life for Aircraft Electronic Equipment, Format for
MIL-N-18307	Nomenclature and Identification for Electronic, Aeronautical, and Aeronautical Support Equipment Including Ground Support Equipment
MIL-C-22750	Coating, Epoxy-Polyamide
MIL-S-23586	Sealing Compound, Electrical Silicone Rubber, accelerator Required
MIL-C-39012	Connectors, Coaxial, Radio Frequency, General Specification for
MIL-B-43666	Box, Shipping Consolidation
MIL-E-46058	Insulating Compound, Electrical (for Coating Printed Circuit Assemblies)
MIL-A-46146	Adhesive-Sealants, Silicone, RTV Non-Corrosive (For use with Sensitive Metals and Equipments)
MIL-C-46168	Coating, Aliphatic, Polyurethane, Chemical Agent Resistant
MIL-R-85664	Receiver-Transmitter, Radio RT-1250A/ARC

STANDARDS

FEDERAL

FED-STD-595 Federal Standard Colors

MILITARY

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-130 Identification Marking of U.S. Military Property

MIL-STD-454 Standard General Requirements for Electronic Equipment

MIL-STD-781 Reliability Tests; Exponential Distribution

MIL-STD-794 Parts and Equipment, Procedures for Packaging and Packing of

MIL-STD-810 Environmental Test Methods

MIL-STD-877 Antenna Subsystems, Airborne, Criteria for Design and Location of

MIL-STD-965 Parts Control Program

MIL-STD-1757 Lightning Qualification Test Techniques for Aerospace Vehicles and Hardware

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. Antennas furnished under this specification shall be products which have passed the qualification tests and are approved for listing on the qualified products list (QPL) at the time set for opening of bids.

3.2 Qualification inspection/testing. In order to be listed on the qualified products list, three samples shall have complied with the qualification inspection/testing (see 4.4 and 6.3). Testing must be authorized by and conducted under the review of the Qualifying Activity.

3.3 Parts and materials. Parts and materials shall be in accordance with MIL-E-5400 for Class 1 equipment, MIL-STD-877, MIL-R-7705, and as specified herein.

3.3.1 Nonstandard part approvals. Approval for the use of nonstandard parts shall be in accordance with MIL-STD-965. Approval of all nonstandard parts shall be completed before qualification approval can be granted.

3.3.2 Parts reliability assurance. When available, all electrical and electronic parts shall be Military approved, established reliability parts. All non-established reliability parts shall be subjected to a 100 percent screening test in accordance with the procedures of 4.8.

3.3.3 Parts derating and applications. All parts used shall be applied well within the ratings. The derating shall encompass the appropriate and meaningful application conditions such as voltage, current, power, temperature, mechanical, and duty cycle. Electronic parts shall conform to Table I Electronic parts derating for worst case electrical and environmental stress unless formal written approval is received from the procuring activity prior to incorporating into the design. Part level stress analysis shall be used to verify that all parameter stresses are within the derated values at worst case circuit and environmental conditions. The limitations on parts usage shall be accordance with Table I.

TABLE I. Part derating requirements

Part Type	Parameter Max.	Max. Allowable Stress
Capacitors	Voltage	50% of rating
Resistors	Power	50% of rating
	Voltage	70% of rating
Transformer/Inductive Devices 1/	Winding Temperature	30° below rated temp.
	Current	70% of rating

1/ Coils wound by the antenna manufacturers shall be considered assemblies, not parts.

3.3.4 Sealing materials (electrical). The antenna shall be encapsulated. The use of encapsulation materials for the purpose of sealing, supporting, attaching or protecting electronic components shall conform to the following requirements, and shall be in strict conformance to sealant manufacturer's instructions.

a. Encapsulating and potting materials shall be hydrolytically stable and conform to MIL-STD-454, Requirement 47.

b. Adhesive sealants used to seal and protect terminations shall conform to MIL-A-46146.

c. If potting compounds are used to seal and protect connector terminations, MIL-S-8516 and MIL-S-23586 Grade B compounds are required.

d. Compatible primers and barrier coatings shall be used where necessary to promote adhesion. Polytetrafluoroethylene (TFE) and Fluorinated Ethylene Propylene surfaces shall be etched to promote adhesion.

e. Conformal coatings shall conform to MIL-E-46058.

f. All organic materials having ester linkages shall have been tested for hydrolytic stability. The use of natural leather, magnesium and magnesium alloys is prohibited.

g. Protection of dissimilar metal combinations shall be in accordance with MIL-STD-454, Requirement 16.

3.3.5 Interchangeability. Physical and functional interchangeability shall exist for the antenna in accordance with MIL-E-5400. The antenna shall be constructed to preclude the requirement for any adjustment when replacing an item by another item of the same type designation.

3.4 Design and construction. The antenna shall conform with all the applicable requirements of MIL-E-5400, MIL-STD-877, MIL-R-7705 and this specification for construction and workmanship. In any case, it is a condition of final acceptance that the antenna shall meet all the performance requirements of this specification.

3.4.1 RF connector. The RF connector shall be as specified in MIL-C-39012 (Series TNC, Uncabled receptacle, socket, jam nut mounted, Class 2).

3.4.2 Maintainability. The antenna shall require no scheduled maintenance.

3.4.2.1 Repairability. The antenna shall be classified as a non-repairable, throw-away type item.

3.4.3 Transportability. The antenna shall be transportable by air, rail, truck and ship when packaged as specified in Section 5.

3.4.4 Standard conditions. The following conditions shall be used to establish normal performance characteristics under standard conditions and for making laboratory bench tests, except that required field tests may be conducted under outside ambient conditions:

- | | |
|----------------|------------------------------------------------------|
| a. Temperature | Room ambient (25 degrees plus or minus 10 degrees C) |
| b. Altitude | Normal ground |
| c. Vibration | None |
| d. Humidity | Room ambient up to 90 percent relative humidity |

3.4.4.1 Service conditions. The antenna shall operate as required under any of the environmental service conditions or combination of these conditions as specified in MIL-E-5400, except as modified herein. The antenna shall meet MIL-E-5400, Class 1, requirements for temperature and altitude. The environmental test methods in 4.5.3 shall apply.

3.4.4.1.1 Thermal conditions. The antenna shall operate as required under the thermal conditions specified by MIL-E-5400, Class 1, without the requirements for auxiliary cooling.

3.4.5 Dimensions. The dimensions of the antenna shall be as specified on Figure 1.

3.4.6 Weight. The weight of the antenna shall be not greater than 3.5 pounds.

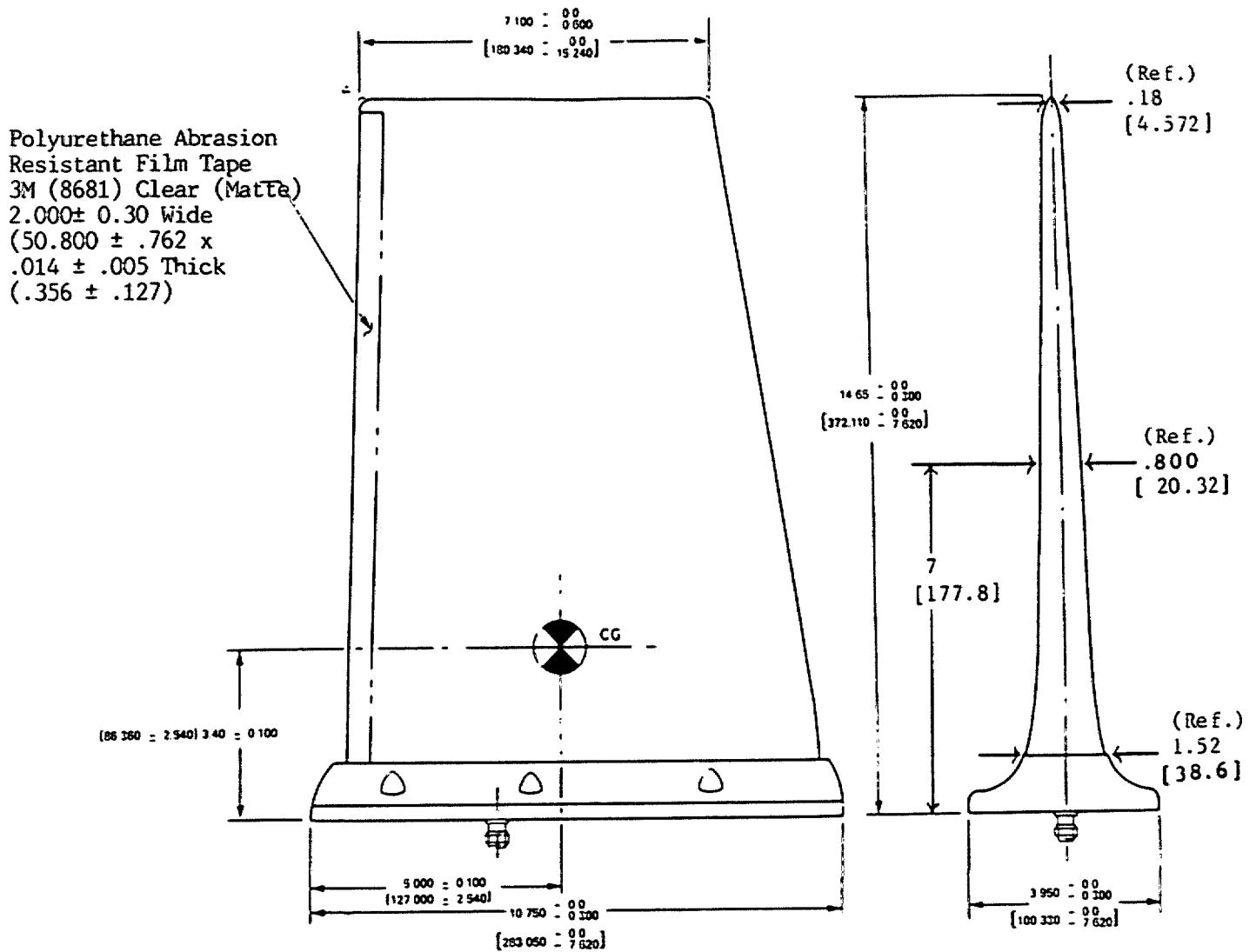
3.4.7 Finish. The exterior finish of the antenna shall be as follows:

a. AS-3191/A color shall be lusterless black epoxy paint in accordance with MIL-C-22750, color number 37038 in accordance with FED-STD-595.

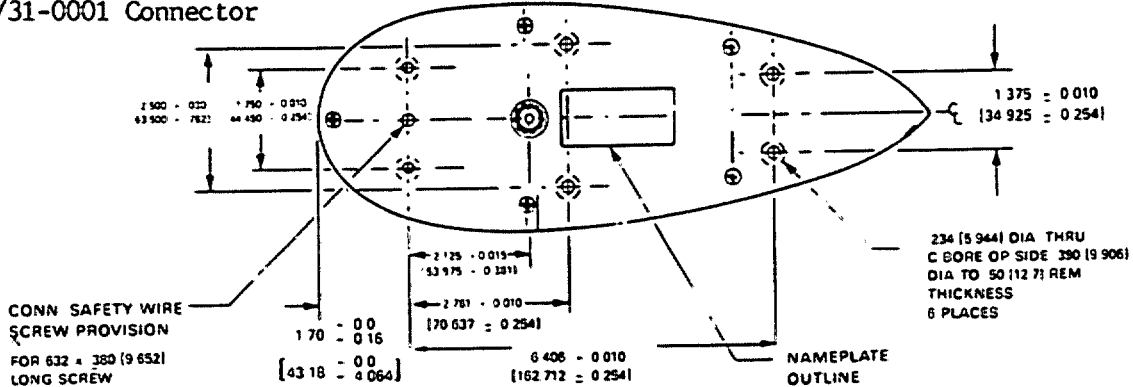
b. AS-3792/A finish shall be gloss white epoxy paint in accordance with MIL-C-22750, color number 17875 in accordance with FED-STD-595.

c. AS-3793/A finish shall be aircraft green in accordance with MIL-C-46168.

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39012/31-0001 Connector



ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

Figure 1. Outline dimensions

3.4.8 Nameplates and identification marking. Serial number assignment and nameplate approval shall be in accordance with MIL-N-18307. Identification marking shall be in accordance with MIL-STD-130. Nameplates and identification markings shall include the following information:

- a. Unit name (Broadband Antenna)
- b. Unit nomenclature (AS-3191/A, AS-3792/A, or AS-3793/A)
- c. Contract number
- d. Manufacturer's code number
- e. Equipment drawing number
- f. Procuring activity

3.4.8.1 Serial numbers. Serial numbers will be assigned by the procuring activity for the antenna under contract or purchase order. The contractor shall serialize sequentially all antennas which are delivered under the contract.

3.4.9 Radome/casting. The radome shall be Type 1, Grade A, Class 1 as specified by MIL-R-7705. Any alloy castings used shall be in accordance with MIL-E-5400. Castings shall be Class 4.

3.5 Performance. Unless otherwise specified herein, values set forth to establish specified performance apply to performance under both standard and extreme service. When reduced performance under the extreme conditions is acceptable, tolerances or values setting forth acceptable variations from the performance under the standard conditions will be specified herein.

3.5.1 Operation. The antenna shall be a universal blade type capable of being used in aircraft equipped with the AN/ARC-182(V) Radio Set. The antenna shall be an aircraft fuselage mounted blade enclosed element. The antenna shall be broadband fix tuned, which shall exhibit omnidirectional radiation pattern, and shall be vertically polarized for radiating and receiving radio waves in the 30-88 MHz, 108-174 MHz, and 225-400 MHz communication bands. Additionally, the antenna shall be compatible with associated equipment listed in 6.3 to meet requirements of 3.6.

3.6 Detail requirements.

3.6.1 Function. The AS-3191/A, AS-3792/A, and AS-3793/A Broadband Antennas shall be aircraft fuselage mounted blades with enclosed elements, for universal installation. The blades shall meet the functional requirements of 3.6.2 through 3.6.9.

3.6.2 Side loading. The antenna shall be designed to withstand a functional side-loading stress of 5.3 PSI and an ultimate side-loading stress of 8.0 PSI.

3.6.3 Bandwidth. The electrical performance specified herein shall be met over the entire frequency bands (30 to 88 MHz, 108 to 174 MHz and 225 to 400 MHz).

3.6.4 Voltage standing wave ratio (VSWR). The antenna VSWR shall be not greater than 2.5:1 in the 30-88 MHz band and the 108-118 MHz portion of the 108-174 MHz band; and shall be not greater than 2.0:1 in the 118-174 MHz portion of the 108-174 MHz band and in the 225-400 MHz band when measured at the antenna connector and referenced to a 50 ohm impedance. VSWR measurements shall be performed with the antenna mounted on a 10 foot square (min) ground plane.

3.6.5 Impedance. The impedance shall be nominally 50 ohms in all bands to operate with a 50 ohm transmitter-receiver output using 50 ohm aircraft cabling.

3.6.6 Radiation pattern gain. The radiation patterns shall be essentially omnidirectional. The antenna gain pattern shall be as specified in Table II when measured on a 32 foot octagonal ground plane with reference to a vertically polarized antenna.

TABLE II. Antenna gain pattern

Frequency (MHz)	Minimum Gain at Beam Max. (dBi)
30	-23.0
40	-21.0
50	-20.0
70	-16.0
88	-11.0
108	- 8.0
130	- 2.5
174	0
225	+ 2.5
300	+ 4.0
400	+ 3.0

The gain shall be determined by comparing the amplitude of the signal received by the blade antenna at its beam maximum with that of a one quarter wavelength monopole (tuned to the frequency of interest) at its beam maximum. The test shall be conducted on a 32 foot octagonal ground plane. Measured values shall be in accordance with Table II. The established reference gain values of the resonant quarter wave length monopole antenna when mounted on the 32 foot octagonal ground plane are:

- a. +3.5 dBi at 30 MHz
- b. +4.5 dBi at 50 MHz
- c. +5.0 dBi at 88, 108, 116, 130, 174, 225, 300, and 400 MHz

3.6.7 Power handling capability. The antenna system shall be capable of handling 100 watts average power in the 225-400 MHz band, 40 watts average power in the 108-174 MHz band, and 40 watts average power in the 30-88 MHz band. Duty cycle shall be continuous.

3.6.8 Polarization. The antenna shall be essentially vertically polarized when mounted on a horizontal ground plane.

3.6.9 Lightning protection. The antenna shall comply with the lightning protection requirements of 4.5.3.7 when the unit is subjected to the current wave form specified in MIL-STD-1757, Test Method T02, Zone 1B.

3.7 Workmanship. Workmanship for the antenna shall conform with MIL-STD-454, Requirement 9.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order; the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Test equipment and inspection facilities. The contractor shall insure that test and inspection facilities of sufficient accuracy, quality and quantity are established and maintained to permit performance of required inspections.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4).
- b. Qualification Testing (see 4.5).
- c. Quality conformance inspection (see 4.6).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed with conditions specified as follows:

- | | |
|----------------|-------------------------------------------------|
| a. Temperature | Room ambient ($25 \pm 10^{\circ}$ C) |
| b. Altitude | Normal ground |
| c. Vibration | None |
| d. Humidity | Room ambient up to 90 percent relative humidity |

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample antennas produced with equipment and procedures normally used in production.

4.4.1 Qualification inspection sample. Three antennas, one of each finish as described by 3.4.7, shall be subjected to the qualification inspection (see Table III). The three samples shall be subjected to the electrical and operational test in Table III. Qualification inspection samples shall first have successfully completed individual tests before being submitted for qualification testing.

4.4.2 Inspection routine. Sample antennas shall be subjected to qualification inspection consisting of the qualification tests in 4.5.2.1 through 4.5.3.8. All three sample antennas shall be subjected to the tests of 4.5.2.1 through 4.5.3.8 in the order listed.

4.4.3 Failures. Any failure incurred shall be reported as soon as possible to the qualifying activity. All failures shall be analyzed to the extent necessary to determine the root cause of the failure and reported to the qualifying activity. The adequacy of corrective actions shall be proven by test. Qualification shall not be granted unless corrective actions are proven by test and implemented in production hardware. Any antenna failure shall be cause for refusal to grant qualification.

4.4.4 Retention of qualification. To retain qualification, the contractor shall forward a report at 6-month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting date. The report shall consist of:

a. Summary of the results of the tests performed for inspection of product for delivery (individual test, 4.6.1 and qualification 4.5.2.1 through 4.5.3.7), indicating as a minimum the number of antennas that have passed, the number that have failed, and the tests which they failed. The results of tests of reworked antennas shall be identified and accounted for.

b. A summary of the results of tests performed for periodic inspection (see 4.6.4), including the number and mode of failures. The summary shall include results of all periodic inspection tests performed and completed during the 6-month period. If the summary of the test results indicates non-conformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the qualified products list. Failure to submit the report within 30 days after the end of each 6-month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the contractor shall immediately notify the qualifying activity at any time during the 6-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification. In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the antenna. If during two consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit his qualified products to testing in accordance with the qualification inspection requirements and the reason for no production.

TABLE III. Inspection requirements.

Requirements	I. Qualification Inspection	II. Quality Conformance Inspections		
		Individual	Sampling	Special
Visual Examination (Workmanship, 3.7)	4.6.1	4.6.1a	_____	As req'd
VSWR (3.6.4)	4.5.2.2	4.6.1b	_____	As req'd
Bandwidth (3.6.3)	4.5.2.2	4.6.1c	_____	_____
Impedance (3.6.5)	4.5.2.2	4.6.1d	_____	_____
Pattern, Polarization, and Gain (3.6.6, 3.6.8)	4.5.2.1	_____	4.5.2.1	As req'd
Power Handling (3.6.7)	4.5.2.3	_____	4.5.2.3	As req'd
Temperature-Altitude (3.4.4.1)	4.5.3.1	_____	4.5.3.1	As req'd
Shock (3.4.4.1)	4.5.3.2	_____	_____	As req'd
Humidity (3.4.4.1)	4.5.3.3	_____	_____	As req'd
Salt Fog (3.4.4.1)	4.5.3.4	_____	4.5.3.4	As req'd
Vibration (3.4.4.1)	4.5.3.5	_____	4.5.3.5	As req'd
Side Loading (3.6.2)	4.5.3.6	_____	_____	As req'd

TABLE III. Inspection requirements - Continued

Requirements	I. Qualification Inspection	II. Quality Conformance Inspections		
		Individual	Sampling	Special
Lightning (3.6.9)	4.5.3.7	_____	_____	As req'd
<u>Certification/ Analysis (3.5)</u> Fungus (3.5)	4.5.3.8a	_____	_____	As req'd
Rain (3.5)	4.5.3.8b	_____	_____	As req'd
Hail Impact (3.5)	4.5.3.8c	_____	_____	As req'd
Static Electricity (3.5)	4.5.3.8d	_____	_____	As req'd
Sunshine (3.5)	4.5.3.8e	_____	_____	As req'd
Fluids (3.5)	4.5.3.8f	_____	_____	As req'd

4.5 Qualification Testing. Qualification testing shall be conducted on three antennas (one of each finish per paragraph 3.4.7) in accordance with Table III. All samples shall be representative of normal production antennas to be supplied under the contract. Before authorization to conduct qualification testing may be granted, the contractor's test procedures must be reviewed and accepted by the qualifying activity (see 4.8).

4.5.1 Scope of qualification tests. Qualification tests shall include electrical tests in accordance with 4.5.2 and environmental tests to determine that the antennas meet all the requirements of this specification, and the contract (see Table III).

4.5.2 Electrical testing. The electrical tests shall include radiation pattern, polarization, gain, VSWR, and power handling.

4.5.2.1 Pattern, polarization, and gain tests. The pattern, polarization, and gain test shall be conducted on a 32 foot octagonal ground plane. The ground plane shall be capable of shielding the operator and all equipment from the antenna

assembly. The complete ground plane shall be so placed that maximum clearance shall be maintained between the radiating elements of the antenna and all foreign objects. The minimum acceptable clearance shall be that of a hemisphere having a radius of 16 feet. The test installation shall be so located that the antenna under test will not be affected by intermittent traffic of personnel.

4.5.2.2 VSWR test. The VSWR, measured at the RF connector and referenced to an impedance of 50 ohms, shall be swept across the frequency bandwidth of 30 to 88 MHz, 108-174 MHz, and 225-400 MHz. The data can be taken by any of the current measurement techniques and presented in the form of an X-Y plot (graph) or oscilloscope picture calibrated in return loss (db) or VSWR.

4.5.2.3 Power handling test. The antenna shall be tested for power handling capability in accordance with 3.6.7.

4.5.3 Environmental tests. Unless otherwise specified herein, antenna performance test during environmental test, may be limited to a VSWR test in accordance with 4.5.2.2 except that power handling and duty cycle shall also be required during temperature-altitude testing.

4.5.3.1 Temperature-altitude. The antenna shall be tested in accordance with MIL-T-810 to verify conformance with the requirements of MIL-T-5400 for Class I equipment. The details, methods and criteria specified in 4.5.3.1.1 and 4.5.3.1.2 apply.

4.5.3.1.1 Applied environments. The antenna shall be subjected to the following worst case cold day, hot day, and flight environments as depicted by the test sequence of Table IV. Each step must be completed in its entirety with no interruptions. Power shall be applied in accordance with 4.5.3.1.2.

4.5.3.1.2 Applied Power. Pre and post test measurements of applied power shall be taken in the test chamber at standard conditions. A physical examination of the antenna shall be conducted after the environmental exposure. When equipment operation is required during the temperature-altitude test, operating time shall be divided equally between the three operational frequency bands of the antenna. The method of applying power shall be as follows:

a. DC power equivalent to the maximum RF power specified shall be applied for the lower and middle frequency bands.

b. The maximum rated RF power level shall be applied at any frequency in the upper band that will allow the antenna to operate at 100 watts. Both forward and reflected power shall be monitored during the test.

c. The test shall be considered failed if the power handling capability of the antenna degrades below the reference level established above. Any discrepancy noted during the post environmental visual examination shall be considered a failure.

Table IV
Temperature-Altitude Test Sequence

Step	Temperature	Duration	Altitude	Operation
1-a	+25 to -54 C	Max Rate	Ground	No
-b	-54 C	20 Hours	Ground	No
-c	-54 C	3 Hours	40,000 Ft.	No
-d	-54 C	1 Hour	40,000 Ft.	Yes
-e	-54 to +25 C	Max Rate	Ground	No
2-a	+25 to +71 C	16 Hours	Ground	No
-b	+71 C	1 Hour	Ground	No
-c	+71 C	3 Hours	Ground	Yes
-d	+71 to -10 C	Max Rate	Ground	No
-e	-10 C	3 Hours	40,000	Yes
-f	-10 to +25 C	Max Rate	Ground	No
3	Repeat Step One			
4	Repeat Step Two			

4.5.3.2 Shock. The antenna shall be tested in accordance with MIL-STD-810, Method 516.3, Procedure 1. The test item shall be mounted in a manner reflecting normal installation on the aircraft. The shock pulse shall be half sine, 15g and 11 milliseconds duration. Pre and post test VSWR measurements shall be conducted.

4.5.3.3 Humidity. The antenna shall be tested in accordance with MIL-STD-810, Method 507.2, Procedure 1, cycle 1. Pre and post test VSWR measurements shall be conducted.

4.5.3.4 Salt fog. The antenna shall be tested in accordance with MIL-STD-810, Method 509.2. Pre and post performance measurements shall be conducted.

4.5.3.5 Random vibration test. A random vibration test shall be conducted as specified in 4.5.3.5.1 through 4.5.3.5.5.

4.5.3.5.1 Test item operation. VSWR shall be monitored during application of random vibration so that the functional effects may be evaluated. The test item shall meet VSWR requirements, as specified, while the functional vibration levels are being applied and immediately preceding and following the application of the endurance levels.

4.5.3.5.2 Mounting techniques. The test item shall be attached by its normal mounting means, either directly to the vibration exciter or transition table, or by means of a rigid fixture capable of transmitting the vibration conditions specified herein. The input control sensing device(s) shall be rigidly attached to the vibration table, or fixture if used, as near as possible to the attachment point(s) of the test item.

4.5.3.5.3 Performance of test. The antenna shall be subjected to the vibration levels and durations of 3.5.3.5.4 and 3.5.3.5.5.

4.5.3.5.4 Test duration. The random vibration test requires two levels, function level and an endurance level. For each axis, one half of the functional test shall be conducted first, then the endurance test, followed by the second half of the functional test. The antenna shall perform according to the specified operating requirements of 4.5.2.2. The acceleration power spectral density (g^2 /Hz) of applied vibration, as measured on the test fixture at mounting point of the test item, shall be as specified in 4.5.3.5.5. Test times shall, for each axis, be one hour each for functional and endurance levels. The instantaneous random vibration acceleration peaks may be limited to three times the rms acceleration level. The power spectral density of the best control signal shall not deviate from the specified requirements by more than +100, -50 percent (+3, -3 dB) between 500 Hz and 2,000 Hz except that deviations as large as +300, -75 percent (+6, -6 dB) shall be allowed over a cumulative bandwidth of 100 Hz maximum, between 500 and 2,000 Hz.

4.5.3.5.5 Vibration levels. The following minimum test levels shall be used:

a. Functional level - 6.79g RMS minimum in accordance with the vibration envelope of Figure 2.

b. Endurance level - 12.1g RMS minimum in accordance with the vibration envelope of Figure 3.

4.5.3.6 Sideloading. The antenna shall be subjected to a design limit side loading test followed by an ultimate side loading test.

4.5.3.6.1 Design limit test. The antenna shall be normally mounted and subjected to a pressure of 5.3 PSI for a minimum of 4 applications. The pressure shall be applied over the entire surface area of either side of the antenna. The deflection of the tip of the antenna shall be measured as the pressure is applied. Full pressure shall be attained within approximately one minute and maintained for one minute. The antenna tip deflection verses time shall be plotted. The pressure shall be applied in a similar manner to the remaining side. This cycle shall be repeated. All four plots shall be similar and display no sharp breaks or angularity. There shall be no physical damage, distortion or permanent set. Any damage indicated, either internal or external, shall be considered a failure. Following the test, the antenna shall comply with electrical performance requirements of 3.6.4.

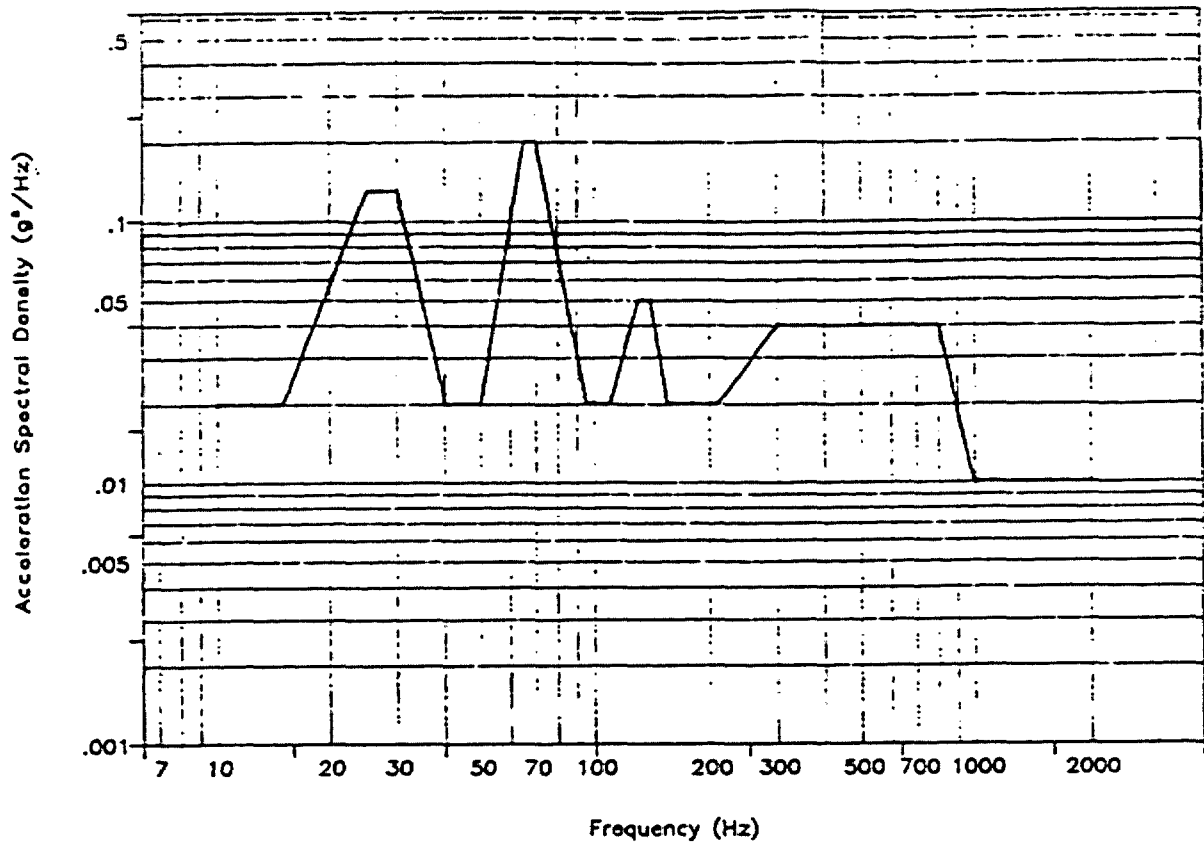
4.5.3.6.2 Ultimate limit test. Following the design limit test the antenna shall be subjected to the ultimate limit test. All conditions shall be the same as for the design limit test with the following exceptions:

- a. The applied pressure shall be 8 PSI.
- b. The pressure shall be applied once to each side.
- c. Damage is acceptable as long as no pieces separate from the test specimen.

4.5.3.7 Lightning protection. The antenna shall be tested to demonstrate compliance with the requirements of 3.6.9 as follows:

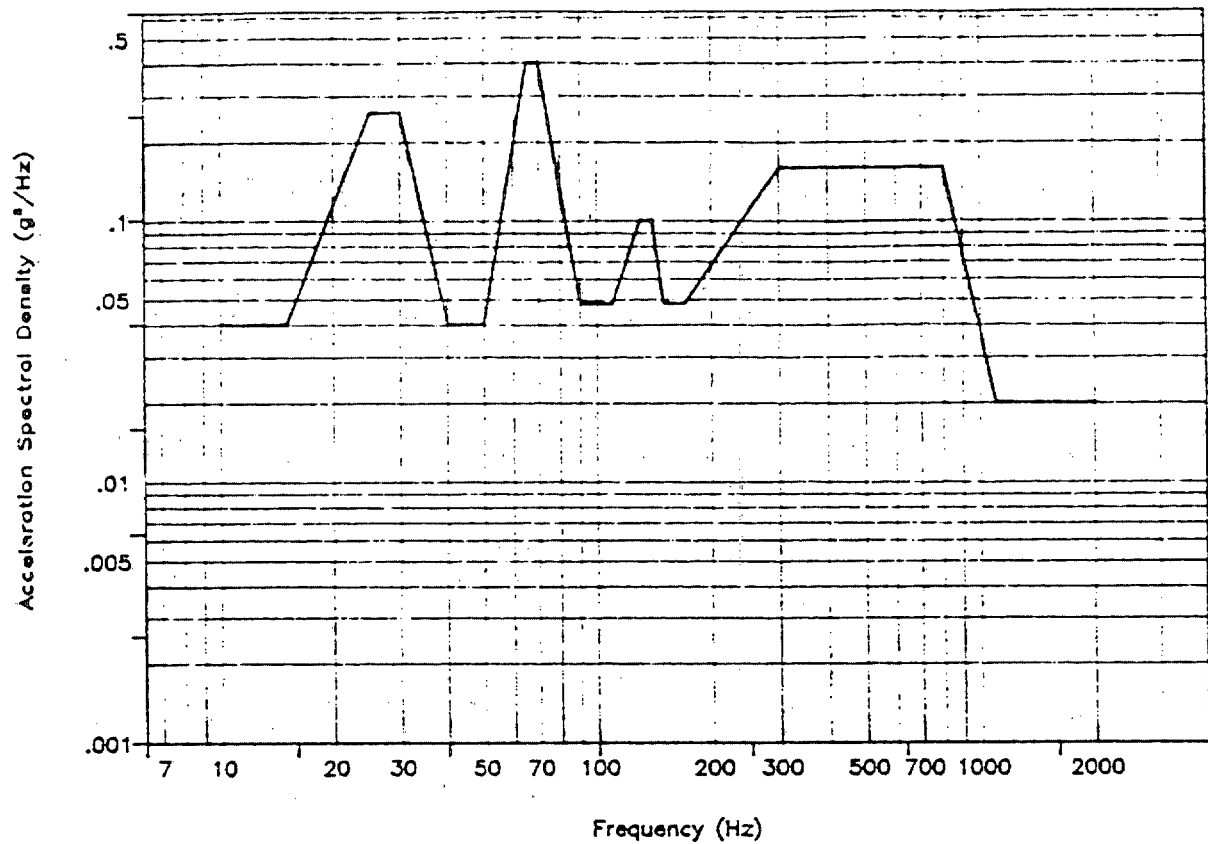
a. The antenna shall be connected to a section of RG-58 coaxial cable that is terminated in 50 ohms.

b. The output of the antenna shall be monitored during the test.



Freq. (Hz)	Level (g^2/Hz)
10	.02
15	.02
25	.13
30	.13
40	.02
50	.02
65	.2
70	.2
95	.02
110	.02
130	.05
140	.05
155	.02
210	.02
300	.04
800	.04
990	.01
2000	.01

Figure 2. Functional random vibration envelope (6.97g RMS)



Freq. (Hz)	Level (g^2/Hz)
10	.04
15	.04
25	.26
30	.26
40	.04
50	.04
65	.4
70	.4
90	.048
110	.048
130	.1
140	.1
150	.048
170	.048
300	.16
800	.16
1100	.02
2000	.02

Figure 3. Endurance random vibration envelope (12.1g RMS)

c. The electrical and mechanical integrity of the RG-58 cable must not be degraded by the test and the antenna must remain securely attached to the mounting plate that is used for the test purposes. The plate may be deformed but shall not be torn.

d. The mounting plate shall be Type 6061-T6, 16 gauge aluminum, octagonal, 3 feet in width, held rigidly at the perimeter.

4.5.3.8 Verification of compliance by similarity. The following requirements may be verified without testing. Analysis of the materials and processes, relative to the particular test requirements, shall be compared to units of a similar type that have been previously subjected to the test. Certification by the contractor of the similarity of existing materials and processes to those proven by previous tests is subject to approval by the qualifying activity. Any information regarding changes in materials and processes since the original qualification must be supplied to the qualifying activity for approval prior to implementing the change. Such changes are subject to re-qualification to the extent deemed necessary by the qualifying activity.

a. Fungus. The requirements of MIL-STD-810, Method 508.2 shall be fulfilled on procuring activity acceptance of the contractor's detailed materials list, and the certification thereof.

b. Rain. The antenna shall be analyzed with consideration to the test in accordance with MIL-STD-810, Method 506.2.

c. Hail impact. The radomes surfaces which are subject to airstream impingement angles greater than 30 degrees shall be analyzed to demonstrate compliance with hail impact requirements for Class 1 radomes as specified in MIL-R-7705.

d. Static electricity. The antenna shall be analyzed to demonstrate compliance with the precipitation static electricity requirements as specified in MIL-R-7705.

e. Sunshine. The plastic radome shall be analyzed to demonstrate compliance with sunshine requirements as specified in MIL-R-7705.

f. Fluids. The antenna shall be analyzed to demonstrate compliance with resistance to fluids requirements as specified in MIL-R-7705 and MIL-STD-877.

4.5.4 Production antennas. Antennas supplied under the production contract shall in all respects, including design, construction, workmanship, performance and quality, be equal to the approved qualification sample(s). Each equipment shall be

capable of successfully passing the same tests as imposed on the preproduction sample. Evidence of non-compliance with the above shall constitute cause for rejection of equipment already accepted by the government.

4.6 Quality conformance inspection. The contractor shall furnish all samples and shall be responsible for accomplishing the quality conformance tests. All inspection and testing may be under the supervision of the procuring activity. The contractor shall retain test data showing quantitative results for all quality conformance tests. Such tests shall be signed/stamped by an authorized representative of the contractor or laboratory, as applicable. Acceptance or approval of material during the course of manufacture shall not be construed as a guarantee of the acceptance of the finished product. Quality conformance tests shall consist of the following (see Table III):

- a. Individual tests (see 4.6.1)
- b. Sampling tests (see 4.6.2)
- c. Special tests (see 4.6.3)

4.6.1 Individual tests. Each antenna submitted for acceptance shall be subjected to the individual tests. The tests shall be adequate to determine compliance with the requirements of materials, workmanship, operational adequacy. All inspections and testing shall be delineated in the acceptance test procedures submitted to the procuring activity. As a minimum, each antenna accepted shall have met the following tests:

- a. Examination of product (see 4.6.1.1)
- b. VSWR (see 3.6.4 and 4.5.2.2)
- c. Bandwidth (see 3.6.3 and 4.5.2.2)
- d. Impedance (see 3.6.5 and 4.5.2.2)

4.6.1.1 Examination of Product. Each antenna shall be examined for compliance with design and construction (3.4) and for workmanship (3.7).

4.6.2 Sampling tests. The sampling tests from Table III shall be conducted on samples randomly selected by the Government inspector according to Table V. The selection shall be made from antennas having passed all the requirements for inspection prior to packaging. Sample selection shall be based only on numbers of antennas produced, or production time period as appropriate, irrespective of color. Any sample shall undergo all required sample tests. Environmental sample tests shall be conducted prior to electrical and performance sample tests. Corrective action following failure shall be verified effective by test on a sample from the next ten produced.

TABLE V. Sampling test sample selection

Sample lot size	Quantity to be selected for sampling test
First 10	1
Next 100, or three months production if less than 100 in three months.	1
Next 200, or three months production if less than 200 in three months.	1

4.6.2.1 Scope of sampling tests. As a minimum, each antenna selected for sampling tests shall be subjected to the following:

- a. VSWR test in accordance with 4.5.2.2.
- b. Pattern, polarization, and gain tests in accordance with 4.5.2.1.
- c. Random vibration test in accordance with 4.5.3.5.
- d. Temperature - altitude test in accordance with 4.5.3.1.
- e. Salt fog test in accordance with 4.5.3.4.
- f. Power handling test in accordance with 4.5.2.3.
- g. Similarity certification in accordance with 4.5.3.8.

4.6.3 Special tests. When specified in the contract, special tests shall be conducted for the purpose of checking the effect of any design or material change in the performance of the antenna and to assure quality control. The antenna selected for special tests may be selected from antennas previously subjected to sampling tests.

4.6.3.1 Special test schedule. Selection of antennas for special tests shall be made as follows:

- a. On an early equipment after an engineering or material change.
- b. Whenever failure reports or other information indicate that additional test are required. (This will be determined by the procuring activity.)

4.6.3.2 Scope of special tests. Special tests shall consist of

such tests as authorized by the procuring activity. Test procedures previously approved for the qualification tests shall be used where applicable.

4.6.4 Equipment failure. Should a failure occur during the sampling or special tests, the following actions shall be taken:

- a. As directed, inform the qualifying activity as soon as possible.
- b. Analyze the failure to determine the root cause.
- c. Propose corrective action, as appropriate.
- d. Implement corrective action, as appropriate.
- e. Test, as appropriate, to verify the effectiveness of the corrective action.
- f. Include the results of (a) through (e) in the report submitted to the qualifying activity.

4.7 Inspection of packaging. The sampling and inspection of the preservation, packing, and container marking shall be in accordance with the requirements of MIL-E-17555, MIL-STD-794, and MIL-STD-129.

4.8 Test procedures. The right is reserved by the procuring activity or the government representative to modify the tests or require any additional tests deemed necessary to determine compliance with the requirements of the specification or the contract. MIL-T-18303 shall be used as a guide for preparation of test procedures. When approved test procedures are available from a previous contract, such procedures will be provided and may be used when their use is authorized by the procuring activity.

4.9 Presubmission testing. No item, part, or complete equipment shall be submitted by the contractor until it has been previously tested by the contractor and found to comply with all applicable requirements of this specification and the contract.

5. PACKAGING

5.1 General. All major units and parts of the antenna shall be preserved, packaged, packed, and marked in accordance with MIL-E-17555 and MIL-STD-794 for the level of shipment specified in the contract or purchase order.

5.2 Marking. Shipments shall be marked in accordance with requirements of MIL-STD-129.

6. NOTES

6.1 Intended use. The antenna covered by this specification is intended for use with the AN/ARC-182(V) radio set described by MIL-R-85664 and NAC Drawing Number 1533AS102. The antenna is also intended to operate with equipment listed in 6.3. The antenna is intended to be newly installed or provide replacement for existing antenna on the fuselage of an aircraft. They are intended for production incorporation in all new aircraft plus retrofit in selected existing aircraft.

6.2 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List (QPL-85670) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is Commander, Naval Air Systems Command, Department of the Navy, Washington, DC 20361 and information pertaining to qualification of products may be obtained from that activity.

6.3 Associated equipment. This equipment should operate with the associated equipment listed in Table VI which should not be supplied as part of this equipment:

TABLE VI. Associated equipment

Item	Equipment Designation	Military Specification or Drawing Number
Receiver-Transmitter	RT-1250A/ARC	MIL-R-85664
Receiver-Transmitter	RT-1324A/ARC	MIL-R-85665
Receiver-Transmitter	RT-1327A/ARC	MIL-R-85665
Receiver-Transmitter	RT-1407/ARC	MIL-R-85655
Switch	SA-521A/A with Selector, Antenna C-2193B/A	MIL-S-28579
Radio Set	AN/ARC-114	MIL-R-55662
Radio Set	AN/ARC-115	MIL-R-55663
Radio Set	AN/ARC-143	MIL-R-81628
Radio Set	AN/ARC-159(V)	MIL-R-81877
Digital Data Communication Set	AN/ASW-27	MIL-D-81770

6.4 Subject term (key word) listing.

AN/ARC-182(V) Radio Set
Broadband Antenna
Broadband Fix Tuned
Enclosed Element
Fuselage Mounted Blade
Hydrolytic Stability
Omnidirectional Radiation Pattern
Polarization
Radome
Universal Blade Type
Universal Installation
Vertical Polarization
Voltage Standing Wave Ratio

6.5 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing activity:
Navy-AS
(Project 5821-N213)

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2. DOCUMENT TITLE

ANTENNA, BROADBAND, AS-3191/A, AS-3792/A, and AS-3793/A

3a. NAME OF SUBMITTING ORGANIZATION**4. TYPE OF ORGANIZATION (Mark one)**☐

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